

## CLAIMS

We claim:

5 ~~Sub 1~~ 1. A porous, flushable, ductile, breathable film, wherein the film is formed from a precursor film, the precursor film comprising a water-soluble polymer and a filler, wherein the filler comprises at least 10 percent by weight of the precursor film, and the precursor film (having an elongation-at-break of greater than about 150%.

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2. The film of Claim 1, wherein the water soluble polymer is poly(ethylene oxide) or modified poly(ethylene oxide).

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3. The film of Claim 2, wherein the modified poly(ethylene oxide) comprises poly(ethylene oxide) having from about 1% to about 30% by weight of grafted polar vinyl monomer.

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4. The film of Claim 3, wherein said polar vinyl monomer is selected from the group consisting of acrylates, methacrylates, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, poly(ethylene glycol) acrylates, poly(ethylene glycol) methacrylates, poly(ethylene glycol) diacrylates, acrylic acid, methacrylic acid, maleic anhydride, itaconic acid, acrylamide, glycidyl methacrylate, 2-bromoethyl acrylate, 2-bromoethyl methacrylate, carboxyethyl acrylate, sodium acrylate, 3-hydroxypropyl methacrylate, 3-hydroxypropyl acrylate, 2-chloroacrylonitrile, 4-chlorophenyl acrylate, 2-cyanoethyl acrylate, glycidyl acrylate, 4-nitrophenyl acrylate, pentabromophenyl acrylate, poly(propylene glycol) acrylates, poly(propylene glycol) methacrylates 2-propene-1-sulfonic acid and its sodium salt, 2-sulfoethyl acrylate, 2-sulfoethyl methacrylate, 3-sulfopropyl acrylate, 3-sulfopropyl methacrylate, poly(ethylene glycol) alkyl ether acrylates, poly(ethylene glycol) alkyl ether methacrylates, poly(ethylene glycol) ethyl ether acrylates, poly(ethylene glycol) ethyl ether methacrylates and derivatives and analogs thereof.

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5. The film of Claim 2, wherein the ~~water soluble polymer~~ has a molecular weight from greater than 200,000 g/mol to about 8,000,000 g/mol.

6. The film of Claim 5, wherein water soluble polymer has a molecular weight from about 200,000 g/mol to about 1,000,000 g/mol.

7. The film of Claim 1, wherein the filler is selected from clay, silica, alumina, powdered metals, glass microspheres, calcium carbonate, barium sulfate, sodium carbonate, magnesium carbonate, magnesium sulfate, barium carbonate, kaolin, carbon, calcium oxide, magnesium oxide, aluminum hydroxide, titanium dioxide, talc, mica, wollastonite, latex particles, particles of thermoplastic elastomers, pulp powders, wood powders, cellulose derivatives, chitin, chitozan powder, organosilicone powders, polyacrylic acid, magnesium sulfate, sodium sulfite, sodium hydrogen sulfite, sodium sulfate, sodium hydrogen sulfate, sodium phosphate, sodium hydrogen phosphate, sodium carbonate, sodium hydrogen carbonate, potassium carbonate, sodium hydroxide, potassium hydroxide, sodium chloride, potassium chloride, or mixtures thereof.

8. The film of Claim 1, wherein the filler comprises calcium carbonate.

9. The film of Claim 1, wherein the filler comprises calcium carbonate with a surface coating material.

10. The film of Claim 9, wherein the surface coating material is a liquid organosilicone with a Hydrophilic-Lipophilic Balance number of from about 6 to about 12.

11. The film of Claim 1, wherein the filler comprises from about 20 to about 50 percent by weight of the film.

12. The film of Claim 1, wherein the film has a thickness of from about 0.01 to about 15 mils.

5 13. The film of Claim 1, wherein the film has a thickness of from about 0.01 to about 2 mils.

14. The film of Claim 1, wherein precursor film has an elongation-at-break of greater than about 200%.

10 15. The film of Claim 1, wherein the filler material has an average particle size that does not exceed about 10 microns.

16. The film of Claim 1, wherein the filler material has an average particle size that does not exceed about 8 microns.

15 17. The film of Claim 1, wherein the filler material has an average particle size that does not exceed about 5 microns.

20 18. The film of Claim 1, wherein the filler material has an average particle size that does not exceed about 1 micron.

25 19. A flushable article comprising:  
the porous, flushable, ductile, breathable film of Claim 1; and  
at least one additional layer adhered to the flushable, ductile,  
breathable film.

30 20. The flushable article of Claim 19, wherein the article comprises a flushable personal care article, a diaper, a feminine pad, a pantliner or training pants.

21. A method of making a water soluble, flushable film comprising extruding a homogeneous blend of a water soluble polymer and a filler into a precursor film, wherein the filler comprises at least 10 percent by weight of the precursor film, and wherein the precursor film has an elongation-at-break of greater than about 150%.

22. The method of Claim 21, wherein the water soluble polymer is poly(ethylene oxide) or modified poly(ethylene oxide).

23. The method of Claim 22, wherein the modified poly(ethylene oxide) comprises poly(ethylene oxide) having from about 1% to about 30% by weight of grafted polar vinyl monomer.

24. The method of Claim 23, wherein said polar vinyl monomer is selected from the group consisting of acrylates, methacrylates, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, poly(ethylene glycol) acrylates, poly(ethylene glycol) methacrylates, poly(ethylene glycol) diacrylates, acrylic acid, methacrylic acid, maleic anhydride, itaconic acid, acrylamide, glycidyl methacrylate, 2-bromoethyl acrylate, 2-bromoethyl methacrylate, carboxyethyl acrylate, sodium acrylate, 3-hydroxypropyl methacrylate, 3-hydroxypropyl acrylate, 2-chloroacrylonitrile, 4-chlorophenyl acrylate, 2-cyanoethyl acrylate, glycidyl acrylate, 4-nitrophenyl acrylate, pentabromophenyl acrylate, poly(propylene glycol) acrylates, poly(propylene glycol) methacrylates 2-propene-1-sulfonic acid and its sodium salt, 2-sulfoethyl acrylate, 2-sulfoethyl methacrylate, 3-sulfopropyl acrylate, 3-sulfopropyl methacrylate, poly(ethylene glycol) alkyl ether acrylates, poly(ethylene glycol) alkyl ether methacrylates, poly(ethylene glycol) ethyl ether acrylates, poly(ethylene glycol) ethyl ether methacrylates and derivatives and analogs thereof.

25. The method of Claim 22, wherein the water soluble polymer has a molecular weight from greater than 200,000 g/mol to about 8,000,000 g/mol.

5 26. The method of Claim 25, wherein water soluble polymer has a molecular weight from about 200,000 g/mol to about 1,000,000 g/mol.

10 27. The method of Claim 21, wherein the filler is selected from clay, silica, alumina, powdered metals, glass microspheres, calcium carbonate, barium sulfate, sodium carbonate, magnesium carbonate, magnesium sulfate, barium carbonate, kaolin, carbon, calcium oxide, magnesium oxide, aluminum hydroxide, titanium dioxide, talc, mica, wollastonite, latex particles, particles of  
15 thermoplastic elastomers, pulp powders, wood powders, cellulose derivatives, chitin, chitozan powder, organosilicone powders, polyacrylic acid, magnesium sulfate, sodium sulfite, sodium hydrogen sulfite, sodium sulfate, sodium hydrogen sulfate, sodium phosphate, sodium hydrogen phosphate, sodium carbonate, sodium hydrogen  
20 carbonate, potassium carbonate, sodium hydroxide, potassium hydroxide, sodium chloride, potassium chloride, or mixtures thereof.

25 28. The method of Claim 21, wherein the filler comprises calcium carbonate.

29. The method of Claim 21, wherein the filler comprises calcium carbonate with a surface coating material.

30 30. The method of Claim 29, wherein the surface coating material is a liquid organosilicone with a Hydrophilic-Lipophilic Balance number of from about 6 to about 12.

35 31. The method of Claim 21, wherein the filler comprises from about 20 to about 50 percent by weight of the film.

32. The method of Claim 21, wherein the film has a thickness of from about 0.01 to about 15 mils.

33. The method of Claim 32, wherein the film has a thickness of from about 0.01 to about 2 mils.

34. The method of Claim 21, further comprising stretching the water soluble, flushable film to increase porosity of the water soluble, flushable film.

35. The method of Claim 34, wherein the water soluble, flushable film is stretched from about 100 to about 300%.

36. The method of Claim 21, wherein precursor film has an elongation-at-break of greater than about 200%.

37. A method of making a homogeneous melt-blend of a water soluble polymer and a filler comprising melt-mixing the water soluble polymer and the filler in a melt-mixing device.

38. The method of Claim 37, wherein the water soluble polymer is poly(ethylene oxide) or modified poly(ethylene oxide).

39. The method of Claim 37, wherein the melt-mixing device is a twin-screw extruder having a feeding section.

40. The method of Claim 39, wherein the water soluble polymer is premixed with a predetermined amount of a filler and then the mixture is fed to the feeding section of the twin-screw extruder to form the homogeneous melt-blend.

41. The method of Claim 40, wherein the water soluble polymer and the filler are simultaneously fed to the feeding section of the twin-screw extruder to form the homogeneous melt-blend.

42. The method of Claim 40, wherein the water soluble polymer is fed to the feeding section of the twin-screw extruder and melted, after which the filler is fed to the water soluble polymer melt to form the homogeneous melt blend.

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